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Economic commentaries

Asset prices, investment, credit and financial vulnerability. An analysis using quarterly figures

*Magdalena D. Riiser, Macroprudential Department, Norges Bank Financial Stability**

Asset prices, investment, credit and financial vulnerability. An analysis using quarterly figures

Magdalena D. Riiser, Senior Adviser, Macroprudential Department, Norges Bank Financial Stability¹

Previous analyses using annual figures for a period of over 150 years show that gap indicators of house prices, equity prices, investment and credit are useful in predicting periods of financial instability in Norway. Calculating these gap indicators using quarterly figures back to the 1970s suggest that the indicators generally follow the same profile, but the variability of the indicators increases somewhat. Gap indicators of asset prices, investment and credit calculated using quarterly figures can thus provide signals of the build-up of risk in the financial system, although the period under analysis is shorter than earlier studies.

Introduction

International academic communities have shown growing interest in indicators that can measure risk in the financial system.² Such indicators have received increased attention following the financial crisis that started in summer 2007. In periods of high systemic risk, the authorities should take action to enhance the resilience of the financial system. The Basel Committee on Banking Supervision has proposed new bank capital and liquidity standards. In addition to stricter minimum capital adequacy requirements for banks, the Basel Committee has proposed that capital buffers requirements should also be introduced, i.e. a conservation buffer and a countercyclical buffer. The countercyclical buffer is a discretionary measure that can be used when systemic risk increases. By tightening the capital requirement the buffer is intended to bolster banks' financial strength. At the same time, it may have a dampening impact on credit growth. The Basel Committee recommends that the size of the countercyclical buffer is linked to a specific indicator of a system-wide risk, i.e. the credit/GDP gap.

Using historical series for Norway over 150 years, Riiser (2005, 2008 and 2010) finds that indicators of house prices, investment, credit and equity prices can provide signals of a build-up of financial imbalances.³ The indicators show a common pattern in that they increase to a high level, i.e. a critical value, prior to the banking crisis in Norway and then fall sharply. Although indicators estimated using annual data provide a good basis for analysing financial vulnerability from a historical perspective, there is a need for indicators that can be updated more frequently, e.g. quarterly, when the indicators are to be used in the regular surveillance of the financial system. In this *Commentary*, the four indicators above are estimated on a quarterly basis. The purpose is to determine the extent to which the path and critical levels of the indicators change when switching from annual figures to quarterly figures.

¹ I would like to thank Ingvild Svendsen for useful comments.

² See, inter alia, Borio and Lowe (2002) and (2004), Borio and Drehmann (2009), Borio, Drehmann, Gambacorta, Jiménez and Trucharte (2010), BIS (2010) and Borio, Drehmann and Tsatsaronis (2011).

³ Riiser uses the same method as Borio and Lowe for calculating the indicators.

Background for the gap indicators

Minsky (1977) and Kindleberger (1978, 2000) find that periods of rapidly rising credit and asset prices may lead to financial instability. Riiser (2005, 2008 and 2010) explores this hypothesis using Norwegian data back to 1819. Increased optimism and risk-taking in good times can push up asset prices, investment and credit. A negative economic shock will reduce optimism. Asset prices and investment will then decline. The value of banks' collateral will be reduced. Debt-servicing becomes more demanding and bank losses rise. Generally, gap indicators in our earlier studies are intended to capture systemic risk and reflect developments in banks' credit risk. The indicator of house prices can provide a measure of changes in credit risk for residential mortgage loans. The investment gap can provide information about credit risk for corporate loans. The gap for overall credit can show how large the banking sector is in relation to the economy and hence the risk of problems in financial institutions or among their borrowers.⁴ These gaps can be an indicator of developments in debt-financed imbalances. Banking system vulnerability can by itself, for example as a result of weaknesses in bank funding or capital or earnings, threaten financial stability. The indicators in this calculation do not take into account banking sector vulnerability. When assessing financial stability, the analysis of gap indicators for asset prices, investment and credit should be supplemented by a robustness analysis of the banking sector.⁵

There is also a close relationship between debt-financed imbalances and increased vulnerabilities in the banking sector. In periods of excessive optimism and high risk-taking, banks may underestimate liquidity risk. High lending growth may also increase their reliance on market funding.⁶

Calculating quarterly indicators

In earlier studies, we use annual data back to 1819 for real house prices, real equity prices, investment as a percentage of GDP, and credit as a percentage of GDP from Norges Bank's Historical Monetary Statistics⁷ and from Statistics Norway. When we calculate quarterly indicators, it is an advantage that the time series are sufficiently long to cover at least two periods of financial vulnerability in Norway, e.g. the banking crisis in 1988-1993 and the financial crisis in 2008-2009. Furthermore, the series should start well ahead of 1987 in order to obtain reliable figures for the trend in the series and hence for the gap, although this is a challenge given the existing statistics. Statistics Norway has published quarterly figures for credit (C3) back to the fourth quarter of 1987. The Association of Norwegian Real Estate Agents, the Association of Real Estate Agency Firms, ECON Pöyry and Finn.no have

⁴ The investment gap and the credit gap are based on investment and credit as a percentage of GDP or GDP mainland Norway

⁵ Riiser (2005) and (2008) underlines the importance of banking sector vulnerability in the analyses of financial stability. An analysis that combines banking sector vulnerability with risk factors outside the banking system is the new cobweb that is used in Norges Bank's report *Financial Stability* (see Dahl, Kloster, Larsen, Rakkestad, Reisvaag, Syversten, Træe, Editor Riiser (2011))

⁶ See, inter alia, Riiser (2008)

⁷ See Eitrheim and Erlandsen (2004), Eitrheim, Gerdrup and Klovland (2004), Grytten (2004) and Klovland (2004)

elaborated quarterly figures for house prices back to 1990.⁸ Quarterly GDP figures date back to 1978 in the national accounts.

In order to obtain long series of quarterly figures, we have used different methods. For credit, we have used published figures from Statistics Norway back to 1987, while farther back we have constructed a time series of quarterly figures for total credit to households, non-financial enterprises and municipalities from Norges Bank's databases. For GDP, we have used Statistics Norway figures and the IMF's and Norges Bank's databases.

For house prices, we have constructed a series with quarterly figures from 1970 to 1990 using linear interpolation of annual figures from Historical Monetary Statistics. As from the fourth quarter of 1990, we use quarterly figures for house prices from the Association of Norwegian Real Estate Agents, the Association of Real Estate Agency Firms, ECON Pöyry and Finn.no.

For investment as a percentage of GDP, we use quarterly figures from the national accounts.

Historical monetary statistics contain series of monthly frequencies for equity prices up to 2011. Quarterly figures are constructed using these series for the Oslo Stock Exchange All Share Index (OSEAX). As was the case in earlier analyses, the series is extended by the increase in the Oslo Stock Exchange Benchmark Index (OSEBX) to the present.

In previous studies, we calculate the trend in the annual series by using a one-sided Hodrick-Prescott filter (HP filter) with Lambda equal to 1600 and a recursive method. The trend in the quarterly series is estimated using the same method, but with Lambda equal to 400 000.⁹ The gaps are measured as percentage deviation from trend, with the exception of the credit gap, which is measured as the percentage point difference from trend.

In the charts, the banking crisis in 1988 Q2 - 1993 Q3 and the financial crisis in 2008 Q3 - 2009 Q3 are marked by the green shaded area. In the period 2002 Q2 - 2003 Q4, banks' loan losses increased, particularly in the fish-farming industry with attendant liquidity strains, although this did not lead to a banking crisis. We have nevertheless shaded this period in the charts, but with a different colour.

Quarterly indicators show a similar profile as that of the annual indicators, with an increase prior to the crises and a decline after the crisis (see Charts 1-4). The cycles in the annual and quarterly gap indicators are also synchronised. The quarterly indicators generally show somewhat wider variations than the annual indicators.

The equity price gap represents to some extent an exception to this pattern in that there are fairly wide differences between the annual and the quarterly indicators. Moreover, the peak prior to the banking crisis in 1988-1993 is fairly low in the indicator with quarterly figures and even lower than the peak prior to the financial crisis in 2008-2009. This is the opposite of that shown by the annual indicator. A likely factor behind the difference between the two

⁸ Like Norges Bank's Historical Monetary Statistics, these figures are hedonic prices. It is advantageous to use hedonic indexes when analysing house prices.

⁹ This is the same method recommended by the Basel Committee when using quarterly figures in estimating countercyclical buffers.

indicators is that the quarterly series covers a shorter period, but it may also be that the variation in the quarterly series is somewhat higher than in the annual series.

Riiser (2005) shows that the credit gap has a somewhat distinctive profile. While the other gaps tend to fall in the years prior to a banking crisis, the credit gap is positive for a longer period during a crisis. The quarterly gap indicators confirm this observation. As a rule, it is the equity price gap, the investment gap or the house price gap that peaks first before falling. The credit gap tends to turn around last.¹⁰ The explanation may be that credit responds to changes in house prices and investment with a lag. As debt is a stock variable that takes time to reduce, the gap will also change more slowly than the three other gaps.

The calculation using annual figures suggests certain thresholds for the gap indicators that may be associated with financial vulnerability, so-called critical values. These values are determined in Riiser's analyses by looking at the peaks preceding the banking crises of the annual gap indicators and by choosing the lowest peak. Measures to strengthen the financial system should, however, be implemented before the indicators reach their critical values. Based on this method and the calculations using annual figures, a house price gap of 17 percent, an investment gap of over 20 percent and a credit of 14-15 percentage points will signal increased financial vulnerability (see Riiser (2010) and Appendix, Charts 5-8). When using quarterly figures the peaks of the gap indicators in the period under analysis move up to a higher level. By looking at the indicators' critical values using annual data and the peaks of the indicators using quarterly data, the critical values using quarterly data can also be derived.

The Basel Committee has explicitly recommended using the credit gap when determining the countercyclical buffer requirement (see BIS (2010)). In its proposed new capital directive CRD IV, the European Commission also recommends that the credit gap should be the main indicator for determining the countercyclical buffer requirement. A critical value for the credit gap could thus be of particular interest. Using annual data, it is the banking crisis in 1988-1993 that determines the critical value of the credit gap (see Appendix, Chart 5). During that banking crisis the quarterly credit gap indicator reaches its peak at close to 21 percentage points in the fourth quarter of 1986 (see Chart 1).¹¹ The critical value for the credit gap using quarterly figures will therefore be 21 percentage points.

The Basel Committee has proposed that the authorities should introduce a countercyclical buffer requirement when the credit gap is at 2 percentage points. The countercyclical buffer reaches its maximum value when the credit gap is at 10 percentage points. The Basel Committee's proposed critical values are based on a broad analysis of banking crises in a selection of countries, inter alia, the banking crisis in Norway and Sweden in the 1990s as examples of severe systemic crises.¹² The upper limit of 10 percentage points for the credit gap is lower than the maximum values for the gap during the crises in the different countries.

¹⁰ An exception is the banking crisis in 1988-1993. The conclusion must be seen in the light of the uncertainty linked to historical data.

¹¹ The credit gap calculated using quarterly figures reaches its peak somewhat earlier than the gap based on annual figures. The annual credit gap reaches its peak at 14-15 percentage points in 1988.

¹² The credit gap values for Norway in the 1990s in BIS (2010) are somewhat higher than the values in this analysis, probably owing to differences in the data for credit and GDP.

The purpose of introducing full countercyclical buffer before the credit gap reaches its historical maximum value is to give the banks time to build up buffers, particularly as the countercyclical buffer requirements will first apply 12 months after they are adopted.

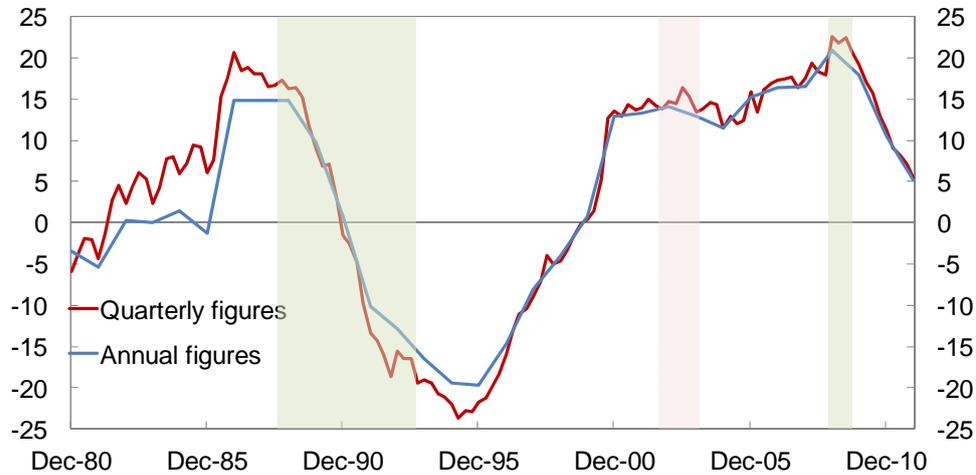
Conclusion

Updated indicators using quarterly figures are important for the regular surveillance of the financial system. The time series for the gap indicators do not go farther back than the 1970s, however. The analysis of long historical series using annual data shows that the gap indicators have been highly stable¹³ and emitted signals of financial imbalances under different regimes and different characteristics of the economy.¹⁴ This *Economic Commentary* shows that within the short period for which we have quarterly data the profile of the gap indicators is unchanged when we switch from annual data to quarterly data. The findings based on the analysis using long series for a period of over 150 years therefore support the use of indicators using quarterly data.

¹³ I.e. that the indicators tend to increase to their critical values prior to the banking crises. At the same time, Riiser (2005) argues that it is conceivable that the critical values are not constant. For example, the gaps may be low, while financial vulnerability may increase if several gaps increase, i.e. depending on the number of indicators. Even if the gaps are low, vulnerability may be high if the banking system is fragile.

¹⁴ An example of a change in a structural feature of the economy is the proportion of households that own their dwelling. This has increased through the years, but the house price gap has still emitted signals around almost all the banking crises in Norway. Furthermore, the indicators are estimated during periods of a fixed exchange rate regime, inflation targeting regime, etc., without the various regimes having influenced the features of the indicators to any considerable extent.

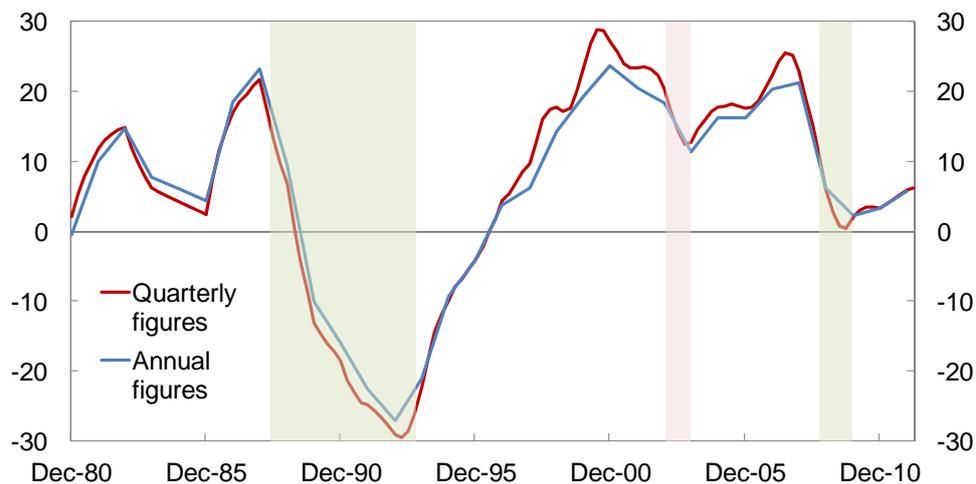
Chart 1 Credit gap¹⁾. Percentage points. Quarterly and annual figures.
December 1980 – December 2011



1) Deviation from trend for total credit to households, non-financial enterprises and municipalities measured as a percentage of GDP (summed over the latest four quarters). From 1995, credit to households, non-financial enterprises and municipalities in mainland Norway as a percentage of GDP mainland Norway. The trend is calculated using a one-sided Hodrick-Prescott filter and Lambda equal to 1600 for annual figures and 400 000 for quarterly figures. The annual gap is calculated using data back to 1899.

Sources: Statistics Norway, IMF and Norges Bank

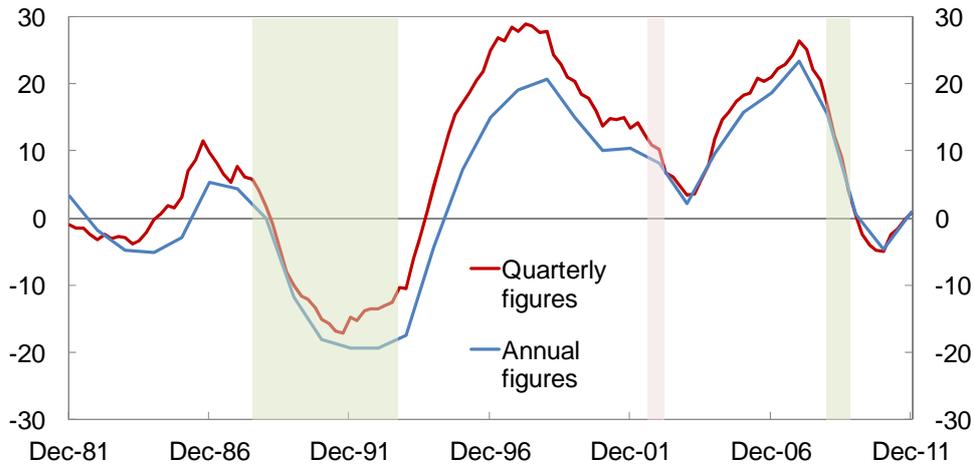
Chart 2 Real house price gap¹⁾. Percent. Quarterly and annual figures.
December 1980 – March 2012



1) Percentage deviation from trend for house price index deflated by consumer price index. Average over the latest four quarters is used for quarterly figures. The trend is calculated using a one-sided Hodrick-Prescott filter and Lambda equal to 1600 for annual figures and 400 000 for quarterly figures. The annual gap is calculated using data back to 1819.

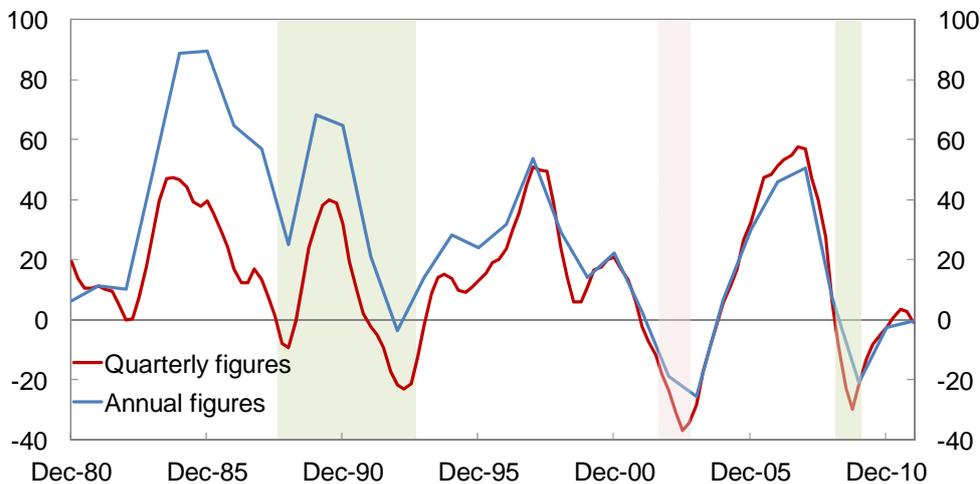
Sources: Association of Norwegian Real Estate Agents, Association of Real Estate Agency Firms, Finn.no, ECON Pöyry, Statistics Norway and Norges Bank

Chart 3 Investment gap¹⁾. Percent. Quarterly and annual figures.
December 1981 – December 2011



1) Percentage deviation from trend for total gross fixed capital formation excl. changes in inventories/statistical deviations measured as a percentage of GDP. From 1970, mainland gross fixed capital formation as a percentage of mainland Norway. Sum over the latest four quarters is used for quarterly figures. The trend is calculated using a one-sided Hodrick-Prescott filter and Lambda equal to 1600 for annual figures and 400 000 for quarterly figures. The annual gap is calculated using data back to 1830.
Sources: Statistics Norway and Norges Bank

Chart 4 Real equity price gap¹⁾. Percent. Quarterly and annual figures.
December 1980 – December 2011



1) Percentage deviation from trend for equity price index deflated by the consumer price index. Average over the latest four quarters is used for quarterly figures. Break in 2001 in connection with change from OSEAX (all-share index) to OSEBX (benchmark index). The trend is calculated using a one-sided Hodrick-Prescott filter and Lambda equal to 1600 for annual figures and 400 000 for quarterly figures. The annual gap is calculated using data back to 1914
Sources: Statistics Norway, Bloomberg and Norges Bank

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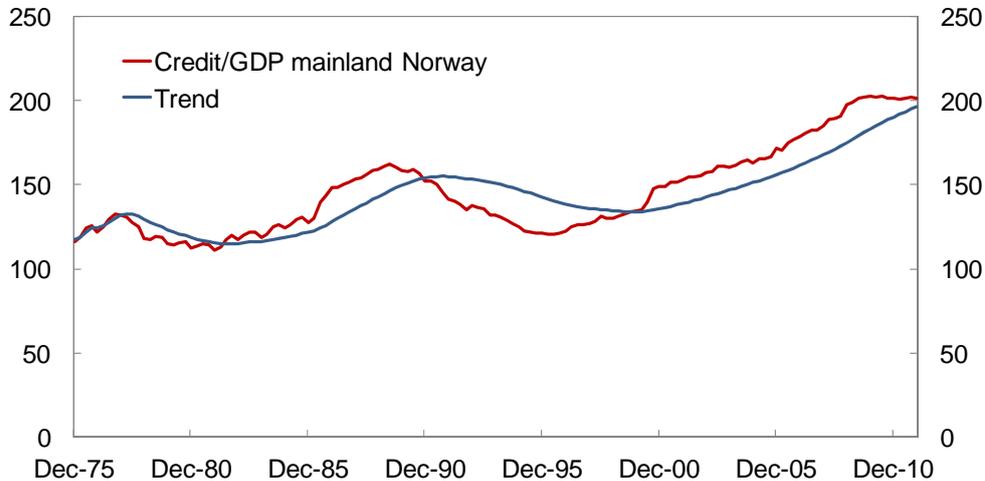
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ANNEX

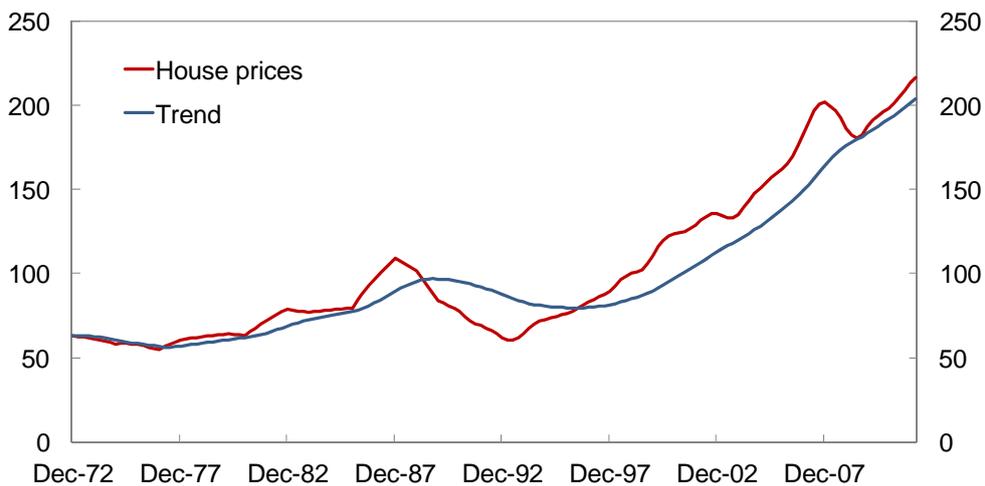
Chart 1 Credit as a percentage of GDP. Mainland Norway.¹⁾ Per cent. Quarterly figures. 1975 Q4 –2011 Q4



1) From 1995, credit to households, non-financial enterprises and municipalities in mainland Norway as a percentage of GDP mainland Norway (summed over the latest four quarters). Before 1995 the ratio is calculated using the increase in the ratio for total credit to households, non-financial enterprises and municipalities as a percentage of GDP (summed over the latest four quarters).

Sources: Statistics Norway, IMF and Norges Bank

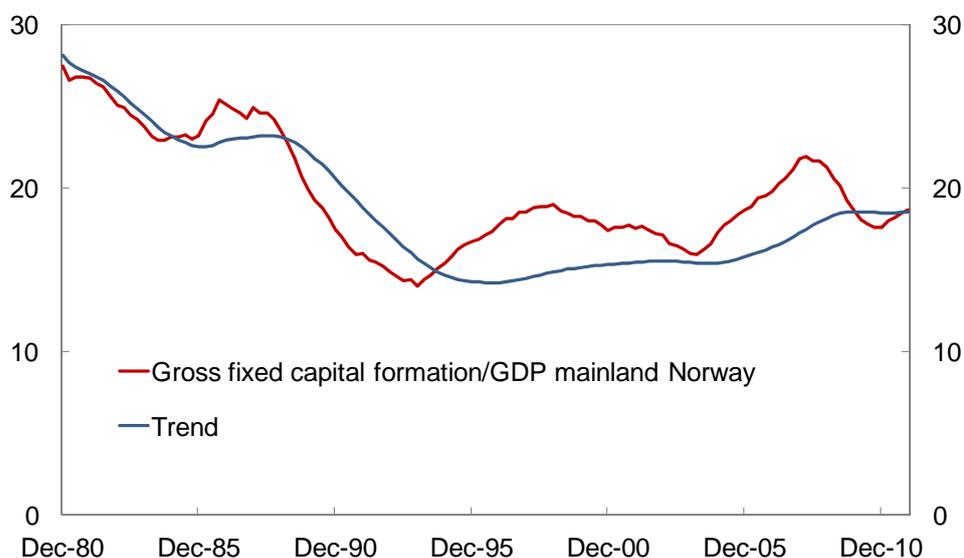
Chart 2 House prices deflated by consumer price index.¹⁾ Index, 1998 Q4 =100. Quarterly figures. 1972 Q4 –2012 Q1



1) House prices and the consumer price index are measured as average over the latest four quarters.

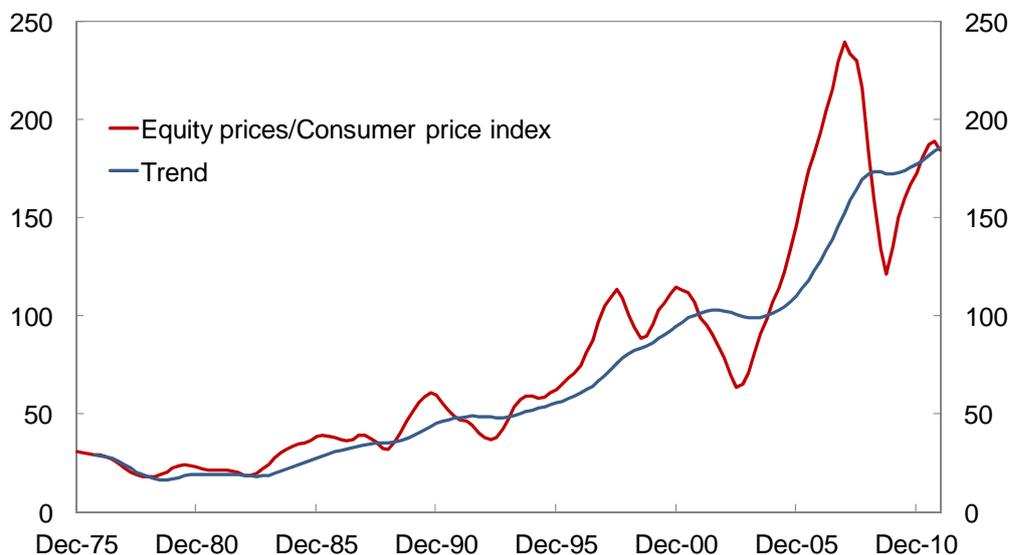
Sources: Association of Norwegian Real Estate Agents, Association of Real Estate Agency Firms, Finn.no, ECON Pöyry, Statistics Norway and Norges Bank

Chart 3 Gross fixed capital formation as a percentage of GDP.¹⁾ Mainland Norway. Percent. Quarterly figures. 1980 Q4 – 2011 Q4



1) Gross fixed capital formation and GDP are summed over the latest four quarters.
Sources: Statistics Norway and Norges Bank

Chart 4 Equity prices deflated by consumer price index.¹⁾ Index, 1998 Q4 =100. Quarterly figures. 1975 Q4 – 2011 Q4

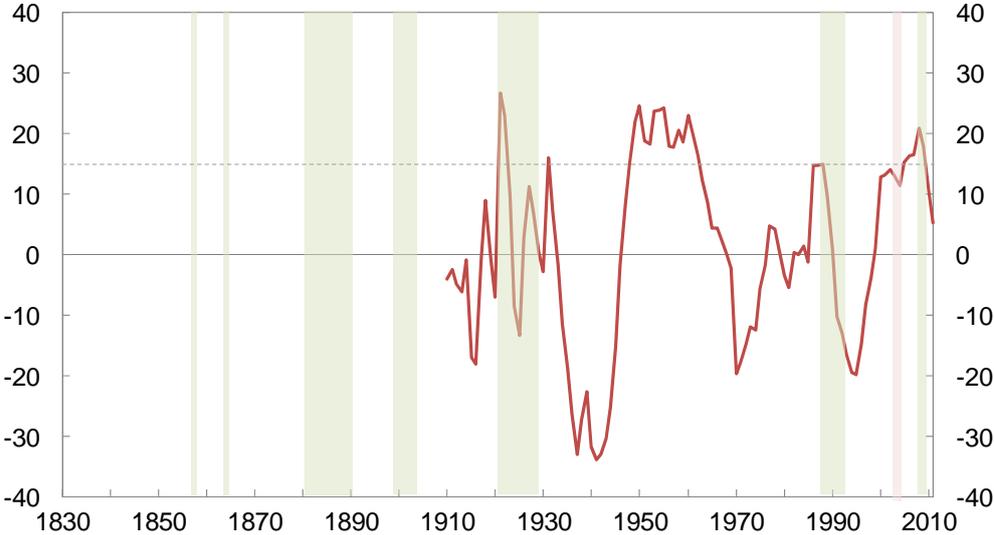


1) Equity prices and the consumer price index are measured as average over the latest four quarters. From 2001 Q3 OSEAX (all-share index) is extended using the increase in OSEBX (benchmark index).

Sources: Statistics Norway, Bloomberg and Norges Bank

Chart 5-8 show the development in the gap indicators for Norway calculated using annual data. In the charts, the banking crises in 1857, 1864, 1880-1890, 1899-1905, 1920-1928, 1988-1993 and 2008-2009 are shaded in green. The 2002-2003 period of financial vulnerability is marked in a slightly different shade.

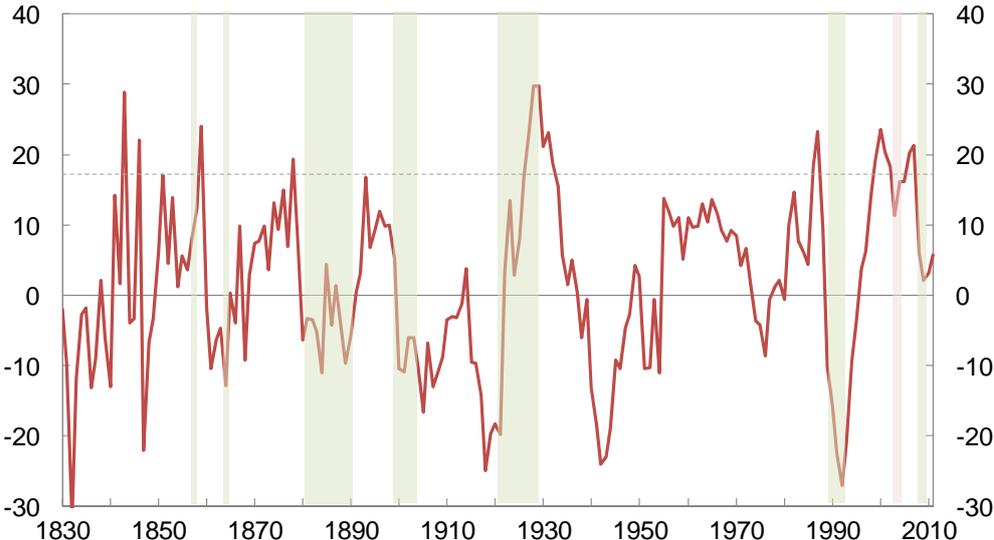
Chart 5 Credit gap¹⁾. Percentage points. Annual figures. 1910-2011



1) Deviation from trend for total credit to households, non-financial enterprises and municipalities measured as a percentage of GDP. From 1995, credit to households, non-financial enterprises and municipalities in mainland Norway as a percentage of GDP mainland Norway. The dashed line denotes the critical value.

Sources: Statistics Norway and Norges Bank

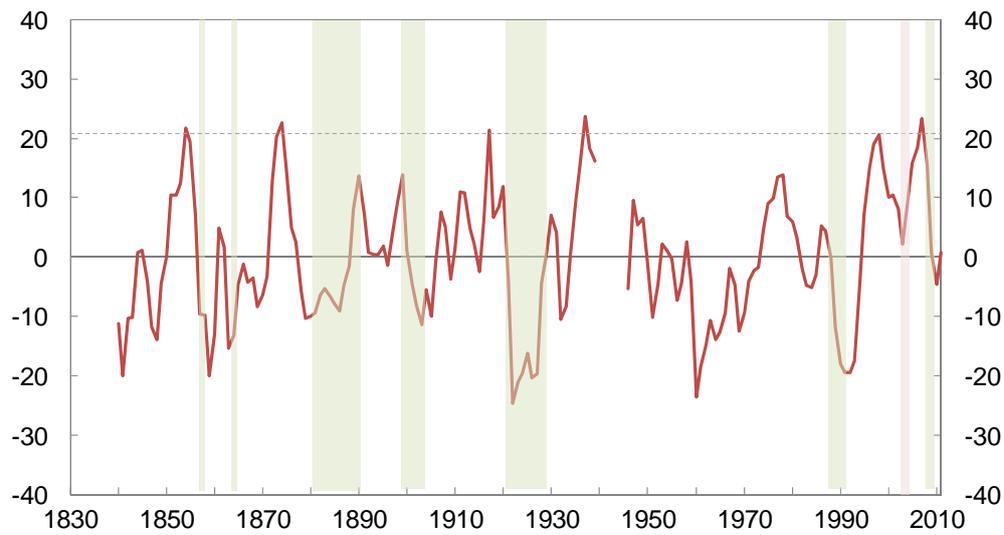
Chart 6 Real house price gap¹⁾. Percent. Annual figures. 1830-2011



1) Percentage deviation from trend for house price index deflated by the consumer price index. The dashed line denotes the critical value.

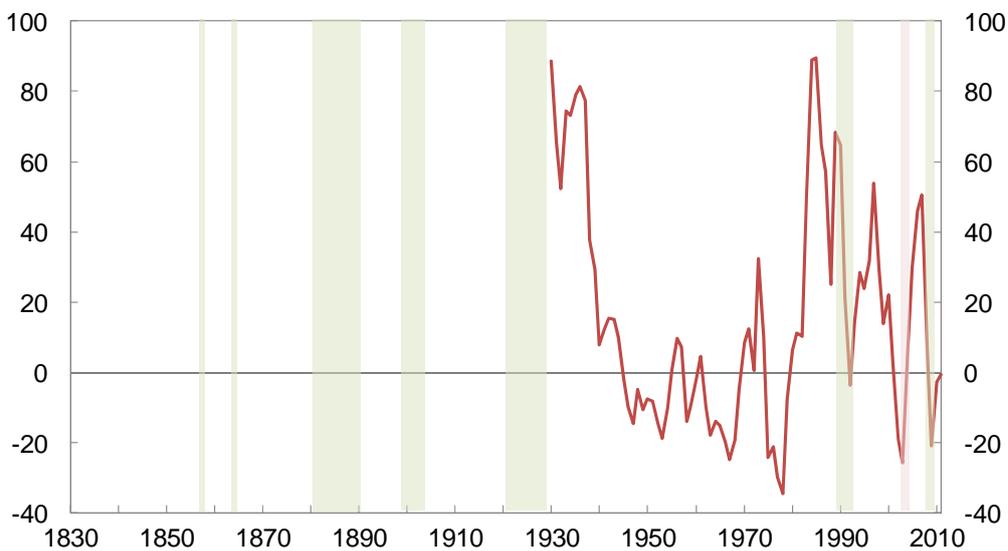
Sources: Association of Norwegian Real Estate Agents, Association of Real Estate Agency Firms, Finn.no, ECON Pöyry, Statistics Norway and Norges Bank

Figur 7 Investment gap¹⁾. Percent. Annual figures. 1840-2011



1) Percentage deviation from trend for gross fixed capital formation, excl. inventory changes/statistical deviation measured as a percentage of GDP. Values lacking in 1940-1945. As from 1970 real gross capital formation for mainland Norway as a percentage of mainland GDP. The dashed line denotes the critical value.
Sources: Statistics Norway and Norges Bank

Figur 8 Equity price gap¹⁾. Percent. Annual figures. 1930-2011



1) Percentage deviation from trend for equity price index deflated by the consumer price index. Break in 2001 in connection with changover from all-share index to benchmark
Sources: Statistics Norway, Bloomberg and Norges Bank